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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,011	03/31/2004	Toshi K. Uchida	273853US90CIP	5558
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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER PEACE, RHONDA S	
			ART UNIT	PAPER NUMBER
			2874	

DATE MAILED: 09/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/814,011

Applicant(s)

UCHIDA ET AL.

Examiner

Rhonda S. Peace

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 and 28-36 is/are rejected.
- 7) ☒ Claim(s) 27 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 32-37 been renumbered 31-36.

Claim 13 objected to because of the following informalities: Claim 13 has been indicated by the applicant to be a dependent claim of claim 1. However, claim 13 is drawn to an optoelectronic module, and not an optoelectronic circuit board, as is described in claim 1. It is the examiner's inference that this claim 13 is to be dependent upon claim 10, instead of claim 1, as claim 10 is drawn to an optoelectronic module. Accordingly, examination of claim 13 has been conducted as though it is dependent upon claim 10. Appropriate correction is required.

Claim 34 recites the limitation "... said contacts being assembled to said substrate for mounting said assembly to a main circuit board." There is insufficient antecedent basis for this limitation in the claim. Examination of claim 34 has been conducted, and it has been assumed by the examiner that electrical contacts, similar to those expressed in claim 31, is present.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7, 9-13, 19, 21, 28, 29, 32, 35, and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Gipson et al (US 4732446).

As it pertains to claim 1, Gipson et al discloses an optoelectronic circuit board comprising the following: a board **10** with embedded optical fibers **16** where the fibers terminate in an end facet on the side wall of hole **14**, as well as an optical emitter **46** and optical detector **44** mounted on the bottom surface of the substrate and electrically connected to electrical conductor **40**, and a reflector **32** supported in hole **16** for reflecting light from the emitter **46** into the embedded fiber **16** (column 5 lines 39-68, Figure 1).

Addressing claims 2, 3, and 6, the emitter **46**, reflector **32**, and detector **44** are incorporated into a chip carrier **12**, that is shaped to fit in hole **16**, and positioned such that the reflector **32** is suspended from the top surface of the board **10** in order to provide optical alignment between the reflector **32** and the fiber **16** (column 6 lines 7-8 and 49-62, Figure 1).

Speaking to claims 4 and 5, the reflector **32** is configured so that it may transmit optical signals in either direction down the fiber **16**, as can be seen in the embodiment shown in Figure 4 (column 5 lines 53-68, and column 6 lines 60-62). In addition, as

shown in Figures 1 and 4, the surface of reflector **12** may be considered a surface of revolution, as it is symmetrical about a central vertical axis drawn through the chip carrier, or plug body.

Relating to claims 7 and 9, the chip carrier **12** is composed of a light transmitting material, and as the reflector **32** is located inside the chip carrier **12**, it can be considered an internally reflecting surface (column 6 lines 49-51, Figure 1). As well, and as previously mentioned, board **10** contains a plurality of fibers **16**, and reflector **32** reflects all beams corresponding to emitter **46** into the end faces of the fibers **16** (column 6 lines 14-30, Figure 2).

Pertaining to claim 10, Gipson et al discloses an optoelectronic module comprising the following: an emitter **46** and detector **44** for detecting and emitting optical signals along optical path **48**, electronic circuit **40** for receiving a signal detected by detector **44**, reflector **32** for reflecting light along optical path **48** as well as in a direction perpendicular to path **48**, where all the above mentioned components are integrated into chip carrier **12** for mounting into circuit board **10** (column 5 lines 43-68, column 6 lines 49-62, Figure 1).

In response to claim 11, optical path **48** enters hole **16** from the fiber **16** end facet and is directed, with the use of reflector **32**, towards the detector **44**. In addition, light produced by emitter **46** travels along a second optical path, perpendicular to optical path **48**, and is directed, by reflector **32**, towards the fiber **16** end facet located on a side wall of hole **14** (column 5 lines 53-68, Figure 1).

With regard to claims 12, 13, 19, and 21, Gipson et al discloses the use of a substrate **38** to which a plurality of emitters **46**, a plurality of detectors **44**, a plurality of electrical conductors **40**, and reflector **32** are mounted (Figure 4, column 6 lines 51-62). Also, reflector **32** is shown as a plane reflector, as can be clearly seen from Figure 1.

Addressing claims 28, 29, and 32, Gipson et al discloses the substrate **38** has a printed circuit, in the form of wire bonding, to connect electrical connector **40** with the emitter **46** and detector **44** (Figure 1, column 6 lines 1-7). In addition, Gipson et al shows optoelectronic module **12** having electrical contacts **56** to be connected to conductor tracks **52** of the main circuit board **10** (Figures 2 and 3, column 6 lines 25-30). As well, electronic connector **40** may be mounted to the top of the substrate **38** (Figure 4, column 6 lines 51-56).

Turning to claims 35 and 36, Gipson et al describes a method of forming the optoelectronic circuit board **10** where optical fibers **16** are embedded within the board **10**, and holes **14**, which extend through the board and optical fibers **16**, so that the fibers **16** are cut and each has an end facet along the side wall of a hole **14** (column 5 lines 42-47, Figure 1). Furthermore, emitters **46** and detectors **44** are mounted to the board **10**, so that their optical axis is directed into hole **14**, and a reflector **32** is suspended within hole **14** for reflecting signals emitted from emitter **46** towards the fiber **16** end facet (column 5 lines 53-68, column 6 lines 7-8, Figure 1).

Claim 34 is rejected under 35 U.S.C. 102(b) as being anticipated by Weidel (US 4966430).

Referencing claim 34, Weidel discloses a substrate **1**, optical devices **7** and **7'** for emitting receiving a light signal along a first optical path through waveguide **5**, an electronic circuits disposed within recess **6** for supplying a drive signal for transducers **7** and **7'**, optical reflectors **8** and **8'** for reflecting the light signal along a path perpendicular to the first optical path through waveguide **5**, electrical contact through electrical conducting layer **3**, where all the above mentioned elements are mounted to a main circuit board **11** such that the first optical path through waveguide **5** is perpendicular to the main circuit board **11** when the assembly is in mounted condition (Figures 1-3, column 3 lines 13-18, 31-45, and column 4 lines 50-54).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 14-18, 20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson et al (US 4732446).

As to claims 14-18, Gipson et al discloses the device as described above, where a plane reflector **32** is used within chip carrier (or plug body) **12**. However, Gipson et al does not disclose the use of concave, convex, conical, paraboloid, or pyramidal reflectors. It is evident to the examiner that the shape of the reflector does not show novelty, as nearly every shape of reflector may be used. In addition, the applicant has failed to attribute any significance to the use of concave, convex, conical, paraboloid, or pyramidal reflectors within their specification, and therefore, each particular arrangement using the above-mentioned shaped reflectors, is deemed to have been a design consideration within the skill of the art (*In re Kuhle*, 526 F.2d 553, 555, 188 USPQ 7, 9). For the reasons just discussed, it would have been obvious to one of

ordinary skill in the art to incorporate any one of the above-mentioned reflectors, as all are well known in the art, and the choice is simply a matter of design preference.

As to claim 20 and 22, Gipson et al discloses the device as described above, including the use of emitters **46** and detectors **44** within the chip carrier, or plug body, **12** (Figure 4). However, Gipson et al does not disclose the specific use of laser diodes as the emitters of choice, or of photodiodes as the specific detectors of choice. However, it would have been obvious to one of ordinary skill in the art to use laser diodes as light emitters and photodiodes as light detectors, as these components are well-known detectors and emitters within the art.

Claims 8, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson et al (US 4732446) in further view of Kropp et al (US 6457875).

Pertaining to claims 8, 23, and 24, Gipson et al discloses the device as previously described. However, Gipson et al does not disclose the use of a lens within the chip carrier **12** for the purpose of condensing light between the reflector **32** and the detector **44** or emitter **46**. Kropp et al discloses an electro-optical arrangement comprising a plug body **6** which utilizes convergent lenses **4** and **5** to condense light between reflectors **18** and **19** and a detector/emitter **1** (Figure 1 column 3 lines 49-53). It would have been obvious to one of ordinary skill in the art to combine the teachings of Kropp et al and Gipson et al, as providing a lens between the emitter (or detector) and the reflecting surface allows for the light signal to be condensed, increasing the probability of proper optical alignment between the fiber (**12** or **14** in the case of Kropp

et al, **16** in the case of Gipson et al) and the emitter or detector (**1** in the case of Kropp et al, **44** or **46** in the case of Gipson et al).

Speaking to claim 25, both Gipson et al and Kropp et al disclose the device as previously described. However, neither Gipson et al nor Kropp et al disclose the use of a divergent lens within the plug body for the purpose of condensing light between the reflector and the detector (or emitter). However, it is apparent to the examiner that the shape of the lens does not show novelty, as both convergent or divergent lenses may be used. In addition, the applicant has failed to attribute any significance to the use of a divergent lens within their specification, and therefore, the particular arrangement using a divergent lens, is deemed to have been a design consideration within the skill of the art (*In re Kuhle*, 526 F.2d 553, 555, 188 USPQ 7, 9). For the reasons just discussed, it would have been obvious to one of ordinary skill in the art to incorporate a divergent lens, instead of a convergent lens, as both are well known in the art, and the choice is simply a matter of design preference.

Addressing claim 26, Gipson et al discloses the device as previously described. However, Gipson et al does not disclose the use of a lens within the chip carrier **12**, or that the lens and reflector are formed as different surfaces of a unitary optical element. Kropp et al shows the construction of lenses **4** and **5** and reflectors **18** and **19** as part of a unitary optical element **6** made of light transmitting material (column 3 lines 49-53, Figure 1). It would have been obvious to one of ordinary skill in the art to combine the teachings of Gipson et al and Kropp et al, as forming the lenses and reflectors as part of a unitary optical element reduces cost and simplifies the manufacturing process, as well

as effectively maintains optical alignment between the emitter or detector and the optical fiber.

Claims 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson et al (US 4732446) in further view of Kosemura (US 6330337).

Pertaining to claims 30-32, Gipson et al discloses the device as previously described. However, Gipson et al does not disclose an arrangement such that the electrical contacts are on the underside of the substrate and are adapted for surface mounting to a main circuit board. Kosemura discloses an optical transceiver module using electrical contacts in the form of solder balls **60**, as can be seen in Figures 12B and 12C, where these solder balls **60** are configured on the bottom of substrate **10** so that the assembly may be mounted upon a main circuit board or motherboard (Figures 12B and 12C, column 20 lines 36-41). In addition, electrical circuits may be located on the top of substrate **10** such as an LSI circuit **52** (Figure 12A-12C, column 19 lines 45-51).

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson et al (US 4732446) in further view of Weidel (US 4966430).

With reference to claim 33, Gipson et al discloses the device as previously described. However, Gipson et al does not disclose an arrangement such that the first optical path is perpendicular to the circuit board. Weidel shows semiconductor circuit where the first optical path, confined within waveguide **5** as shown in Figure 2, is perpendicular to the circuit board that may be configured to the circuit, as shown in

Figure 3 (Figures 2 and 3, column 3 lines 31-37, column 4 lines 44-54). It would have been obvious to one of ordinary skill in the art to combine the teachings of Weidel and Gipson et al as this allows for the device to be used in a wider range of scenarios, including those when the circuit board is in an upright position.

Allowable Subject Matter

Claim 27 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The most relevant prior art discussed within this Office Action does not disclose, nor does it reasonably suggest an optoelectronic module comprising a unitary optical element with a biconvex top surface and an internally reflecting bottom surface. As claim 27 contains this limitation not disclosed by the relevant prior art, it is the opinion of the examiner that these claims contain patentable material, and would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tabuchi (US 5764832) discloses an integrated semiconductor optical device employing a substrate having an alignment groove. Hauer et al (US 5600741) discloses an arrangement for coupling optoelectronic components and optical

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waveguides to one another. Goossen et al (US 5786925) discloses a composition for angle mirrors in substrates for use in hybrid optical systems. Chakravorty et al (US 6512861) discloses a packaging and assembly method for optical coupling between an LED mounted upon a substrate with a waveguide embedded within the substrate. Lam (US 2004/0022496) discloses a photonic integrated circuit including an optical waveguide embedded within a substrate. Umebayshi et al (US 6944377) discloses an optical communication device provided within a substrate. Reedy et al (US 6869229) discloses a method and device having coupled optical and optoelectronic devices. Uchida et al (US 2004/0042705) discloses a device having embedded optical coupling in circuit boards.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571) 272-8580. The examiner can normally be reached on M-F (8-5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272- 2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rhonda S. Peace
Examiner
Art Unit 2874



MICHELLE CONNELLY-CUSHWA
PRIMARY EXAMINER